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COMPARATIVE VALUE OF FUEL.—As a knowledge of the relative value of the various kinds of fuel in use cannot fail to be of interest to all, and of benefit to most of our readers, we do not hesitate to publish at length the following very valuable article from Porter's Chemistry of the Arts. The information contained therein, if properly applied to the every-day business of life, will amply repay each reader for his subscription to the Mechanics' Magazine—even if he has paid in advance. The table of the comparative value of the 64 different kinds of fuel should be frequently read by those who desire to use economy in obtaining their supply of fuel.

Whatever kind of fuel it may be considered best to employ, it is extremely desirable that it should be as dry as possible, otherwise a great part of the heat it contains will be lost in converting the water in the fuel into vapor, which of course escapes up the chimney without producing any useful effect.

Fuel is often unnecessarily exposed to the weather, or put in wet places; and the injurious effect of introducing damp into a close fire-place is never considered.

Pit Coals.—There is considerable difference between the pit coals; and it has perhaps been too little attended to by those who are the chief consumers of this expensive article. The subject has not even been studied with much attention, except so far as relates to the production of gas; and the facts that have been established by these researches are not very useful in other applications of fuel.

Caking coal, also called binding coal, crozzling coal, is obtained in great abundance from the extensive coal-fields in Northumberland and Durham; and is that which is sold in the London market as Newcastle coal.

When heated, this coal breaks asunder into small pieces; and the heat being raised to a certain degree, the pieces cohere, and form a solid mass, from which property it is called caking-coal. It lights easily, and burns with a lively yellow flame. It requires to be frequently stirred or broken up, particularly when it cakes very hard; but different varieties differ considerably in this property. Of the Newcastle coals, the best Wall's-End make a brilliant and pleasing fire, burn away quickly, and do not cake hard, hence it is preferred for heating rooms; but the Tanfield Moor burn slowly, cake very hard, and afford a strong and long-continued heat, and is used in furnaces and forges. The other varieties are of an intermediate character.

Caking coal gives out a great quantity of heat, and, with attention, burns a long time; consequently, where it can be procured at a reasonable price, it is commonly preferred.

From the trials of Mr. Watt, it appears that a bushel of Newcastle coals, which weigh, on an average, eighty-four pounds, will convert from eight to twelve cubic feet of water into steam, from the mean temperature of the atmosphere; and that a bushel of Swansea coal will produce an equal effect.

Dr. Black states to the effect, that 7 pounds .91 of the best Newcastle coal will convert one cubic foot of water into steam, capable of supporting the mean pressure of the atmosphere.

In some experiments tried by Messrs. Parkes, it appears, that by their improved method of constructing boilers, an effect was obtained, equivalent to converting one cubic foot of water into steam from the mean temperature, with 7 pounds .45

of coal, in the case where the greatest effect was produced; but at a mean, 8 pounds .15 of coal were necessary to produce the same effect; which is only one quarter of a pound less than the mean of Mr. Watt. From a mean of several experiments, Smeaton makes it require 11 pounds .4 of coal to produce the same effect; but the kind of coal is not described.

Mr. Tredgold found that after the brick-work, &c. of the boiler of a steam-engine was warmed, a little less than one pound of Wall's-End coals would make a cubic foot of water boil, from the mean temperature of fifty-two degrees. To produce the same effect with inferior coals, a stronger draught, and more time and attention, was necessary.

Splint Coal, or hard coal, called slaty cannel coal by Kirwan, is esteemed equally valuable, for many purposes, as the Newcastle caking coal. It is obtained near Glasgow, in Ayrshire, Scotland, and in several of the English and Welsh coal-fields.

A greater heat is necessary to make it kindle than is required for caking coal, and consequently it is not so well adapted for a small fire; but a large body of splint coal makes a strong and lasting fire. It does not produce so much flame, nor so much smoke, as caking coal, and does not agglutinate or bind together.

The splint coal of Scotland was considered by Smeaton to be equal to Newcastle coal for steam-engines.

Cherry Coal, or soft coal, constitutes, says Dr. Thomson, the greater part of the upper seams of coal in the Glasgow coal-fields; and it is also abundant in Fifeshire. He considers the Staffordshire coal to be of the same species; and the Edinburgh as intermediate between it and splint coal.

It readily catches fire, and burns with a clear yellow flame, giving out much heat; and the flame continues till nearly the whole of the coal be consumed. It burns away more rapidly than either caking or splint coal, and leaves a white ash. For most purposes it is less economical. It is easily distinguished from caking coal, by its not melting or becoming soft when heated. It makes a more agreeable fire, and does not require to be stirred. It requires care and management in an open grate, even to burn the small fragments which are made in breaking up the pieces to a fit size for the fire. Hence the small coals are often mixed with clay and made into balls. When these balls are dry, they make an excellent addition to the fuel for an open fire, producing a very durable heat.

Mr. Watt states that one hundred weight of good Wednesbury coal will produce the same effect as one bushel of Newcastle coal.

Wood.—In some places wood is used for fuel; its effect in producing heat is found to depend considerably on its state of dryness. Several experiments, made by Count Rumford, show the effect of dry wood to be much greater than that of unseasoned. Unseasoned wood contains about one third of its weight of water. The kind of wood is also a cause of some difference; from the experiments of Count Rumford, lime-tree wood gives out most heat in burning.

With his improved boilers Count Rumford made 20 pounds .10 of ice-cold water boil with one pound of dry pine wood. The same weight of pine wood unseasoned, would produce less effect by one-seventh. Beech wood afforded much less heat than pine; for one pound of dry beech made 14 pounds .33 of ice-cold water boil. A cubic foot of dry beech weighs about forty-four pounds.

According to Fossombroni, wood produces heat enough in its combustion to evaporate twice its weight of water, or to prepare two-thirds of its weight of salt Count Rumford's trials make the effect of wood about one-third more, which may fairly be attributed to his superior skill.

Peat, considered only as a fuel, may be divided into two kinds. The first is compact and heavy, of a brownish black color, and with scarcely any vestiges of its vegetable origin remaining. This is the best kind. When it is once lighted it preserves fire a long time.

The second kind is light and spongy, of a brown color, and seems to be a mass of dead plants and roots, which have undergone very little change; it inflames readily, and is quickly consumed.

Peat gives out an odor, while it is burning, which is disagreeable to those who are not accustomed to it. It affords a mild and gentle heat; but is not a good kind of fuel for supplying furnaces for

boilers; it is much better adapted for flues. It is of various qualities: some burn quickly with a bright flame; others burn slowly, and, according to Clement and Desormes, afford one-fifth of the heat that would be given out by an equal weight of charcoal. This nearly coincides with the ratio given by Blavier and Miche.

The weight of a cubic foot varies from forty-four to seventy pounds; and the dense varieties afford about forty per cent. of charcoal; the other varieties nearly in proportion to their density.

Charcoal.—Mr. Dalton, by heating water, obtained a result equivalent to melting forty pounds of ice with one pound of charcoal. But Dr. Crawford's experiments give sixty-nine pounds of ice melted by one pound of charcoal. Lavoisier's give ninety-five pounds and a half; Clement and Desormes ninety-five pounds; and Hassenfratz's trials, on various kinds, give a mean of ninety-two pounds of ice melted by one of charcoal, his highest result being ninety-six pounds, and lowest one seventy-four pounds. Mr. Tredgold considers forty-seven pounds of ice melted by one pound of charcoal as the real average effect of that fuel. A cubic foot of charcoal weighs about fifteen pounds.

Coke.—Lavoisier makes the quantity of coal to be that of coke as 605 is to 552 when the same effect is produced; and in addition to this increased power of giving out heat, it must also be considered that coke gives out no smoke in burning, whence it should always be used in furnaces seated in towns, in order to prevent any annoyance to the neighbors.

The present prevalent use of gas, for lighting towns and even houses, has brought a considerable quantity of *gas coke* into the market, which does well enough for heating rooms, but is far inferior to the stifled coke in its heating power, so that smiths and iron founders invariably use the latter kind, and when a great heat is required, the chemist should follow their example.

Coke has been tried against wood in Paris for warming the Opera-House. Fifty-eight pounds of coke, costing there about 1*s.* 3*d.*, produced the same effect as 160 pounds of wood, costing there about 2*s.* 6*d.*

Charred Peat.—According to Messrs. Blavier and Miche it requires 1666 pounds of charred peat to produce the same effect as 740 pounds of common charcoal.

The charred peat, made by stifling, is superior, in its power of producing heat, to that made by distillation. Unfortunately the stifled charred peat is a kind of pyrophorus, which takes fire if it becomes accidentally wetted, or even in moist weather. In consequence of this property several accidents have happened by the rain finding its way into places where it is kept; it is on this account forbidden, by the laws of some countries, to be kept in towns.

Therefore the Dutch, who burn this fuel, not only in their houses, but even in pans under their feet while they are at church in winter, are in the habit of charring it at home as it is wanted. It is first burnt in the kitchen, and when they find it is red hot quite through, they then take it off the fire, put it in a close earthen or copper pot, and cover it down with a wet woollen or linen cloth, and by the air being excluded the fire is soon extinguished, and when it is cold it will resemble charcoal, except being covered with white ashes, and will, if properly charred, burn with scarce any smoke, and very little of the suffocating quality which charcoal has. This it is that makes the charred peat so proper for green-houses, for charcoal burnt in them is very prejudicial to the plants, and often fatal to the person who attends them.

[The intelligent author has here certainly fallen into a popular error in regard to the true cause of the suffocating quality of burning charcoal. The product of the combustion of charcoal must be essentially the same as from charred peat: the combustible part of both is little else than pure carbon, and the products of their combustion are of course pure carbonic acid. The popular notion is, that the unpleasant odor exhaled from burning charcoal, which has for some time been exposed to a damp atmosphere, and particularly when first ignited, is the suffocating principle: hence the common impression that ignited charcoal taken from a common fire may be burned with impunity in an unventilated room, and that charred peat, which does not exhale the peculiar odor of charcoal, is a safer and less objectionable fuel under the same

circumstances. Many lives are annually sacrificed from this erroneous notion. The only true ground of preference of charred peat for burning in green-houses is the slow and gradual manner in which it consumes. Charcoal, in this respect, is much less manageable. It is the sudden and unequal heats from charcoal, rather than any essential difference in the product, that renders its use so objectionable.]

The usual method of burning this peat in Holland, especially by the poor, is in cast iron kettles, and for boiling any thing over it this way saves half the fire it would otherwise take if burnt on a hearth, or in a grate, by the side of the pot reflecting the heat.

[The small Philadelphia furnaces, fabricated from the South Amboy clay of New Jersey, now in general use in our Atlantic cities, are admirably calculated to secure an economical expenditure of heat in the combustion of charcoal for culinary purposes, and for a similar reason. But they ought never to be used in an unventilated room.]

Adjoining to many of the capital towns in Holland there are a great number of small gardens with little summer houses, most of which are built with wood. Near Rotterdam there are nearly a thousand of these gardens, and almost all of them have some orange trees in them. In the winter they are preserved from the intense frosts, which generally last there for nearly three months, by means of this charred peat, the natural firing of that country, which is burnt in an earthen pan, or cast iron pot, in these little summer houses.

A collected view of the data from these experiments and comparisons is given by Mr. Tredgold. It is as follows :

Kind of Fuel,	Fraction of a pound that will heat one cubic foot of water one degree Fahrenheit's scale.	Pounds of fuel that will convert one cubic foot of water into steam.
Newcastle, or caking Coal	0.0075	8.40
Splint Coal	0.0075	8.40
Staffordshire cherry Coal	0.0100	11.20
Wood, dry pine	0.0172	19.25
—— dry beech	0.0242	27,00
—— dry oak	0.0265	30.00
Peat, of good quality	0.0475	53.60
Charcoal	0.0095	10.60
Coke	0.0069	7.70
Charred Peat	0.0205	23.00

It will appear, as Mr. Tredgold justly observes in his very excellent "Principles of Warming and Ventilating Public Buildings," that the utmost effect we can hope to gain in applying fuel must be less than double the measure of effect here given; and even to attain that effect, all the caution of conducting a philosophical experiment must be continually employed, which will be found impracticable on a large scale, and altogether incompatible with the simple apparatus and small share of attention which can be devoted to this end in real business, although there are not wanting persons who promise four, six, and even ten times these effects.

Improvement of Fuel by Mixture.—It is surprising that so few attempts should be made to improve the fires which are made in the open chimneys of elegant apartments by preparing the fuel; for, as Count Rumford observes, nothing surely was ever more dirty, inelegant, and disgusting, than a common coal fire.

Fire balls, of the size of goose eggs, composed of coal and charcoal in powder, mixed up with a due proportion of wet clay, and well dried, would make a much more cleanly, and, in all respects, a pleasanter fire than can be made with crude coals; and it is believed would not be more expensive fuel. In Flanders, and in several parts of Germany, and particularly in the duchies of Juliers and Bergens, where coals are used as fuel, the coals are always prepared before they are used, by pounding them to a powder, and mixing them up with an equal weight of clay and a sufficient quantity of water to form the whole into a mass, which is kneaded together and formed into cakes; which cakes are afterwards well dried, and kept in a dry place for use. And it has been found, by long experience, that the expense attending this preparation is amply repaid by the improvement of the fuel. The coals thus mixed with clay not only burn longer, but give much more heat than when they are burnt in their crude state.

It will doubtless appear extraordinary to those who have not considered the subject with some attention, that the quantity of heat produced in the combustion of any given quantity of coal should be increased by mixing the coals with clay, which is

certainly an incombustible body; but the fact is certain.

In composing fire balls, it is probable that a certain proportion of chaff, of straw cut very fine, or even of saw dust, might be employed with great advantage. It is wished that those who have leisure would turn their thoughts to this subject; for it is conceived that very important improvements would result from a thorough investigation of it.

For the purpose of lighting a fire speedily, *kindling balls*, composed of equal parts of coal, charcoal, and clay, the two former reduced to a fine powder, well mixed, and kneaded together with the clay moistened with water, and then formed into balls of the size of hens' eggs, and thoroughly dried, might be used with great advantage instead of wood.

These kindling balls may be made so inflammable as to take fire in an instant, and with the smallest spark, by dipping them in a solution of nitre, and then drying them again; and they would neither be expensive nor liable to spoil by long keeping. Perhaps a quantity of pure charcoal, reduced to very fine powder, and mixed with the solution of nitre in which they are dipped, would render them still more inflammable.

[The foregoing meagre account of the relative value of several varieties of fuel, as determined by the heat produced in combustion, comprises about all the information which the labors of Crawford, Lavoisier, Rumford, Watt, Dalton, Clement, Desormes, and other philosophers, have shed upon the subject previous to the publication of Mr. Bull of Philadelphia, entitled "Experiments to Determine the Comparative Value of the Principal Varieties of Fuel used in the United States and in Europe," read before the American Philosophical Society of Philadelphia, in April, 1826. This is by far the most extended, systematic, and successful, effort yet made in this interesting field of experimental inquiry. I am indebted to the politeness of Mr. Bull for permission to transcribe the tabular results of his experiments, and such other portions of his interesting paper as more immediately comports with the practical character and design of this work; but would earnestly recommend the perusal of the whole paper to every scientific manufacturer, or artisan, whose processes involve any considerable consumption of fuel, as well as to enlightened readers of every class; for no subject is more generally interesting in our cold climate than the most economical means of producing artificial heat.

The general principle on which Mr. Bull's experiments were conducted, for determining the comparative heat evolved in the combustion of the different varieties of fuel operated on, was to burn them in a close room, and note the time that the combustion of a given weight of each would sustain the air of the room at a temperature of 10° above the surrounding medium. To obviate the influence which the ordinary atmospheric changes of temperature and the winds would produce on the results, by furnishing a surrounding "refrigerating medium of inconstant power," the room in which the experiments were performed was surrounded by double walls, and the intermediate space sustained by artificial heat during the experiments, at a uniform temperature, and somewhat higher than the greatest natural temperature of the external atmosphere. The actual temperature of the inner and the outer rooms, during the experiment, was determined by common mercurial thermometers suspended in each, and the difference of temperature by Leslie's differential thermometer, the horizontal part of which traversed the inner wall, or partition, leaving a bulb and upright stem on each side. The combustion was effected in a small upright cylindrical stove furnished with forty-two feet of sheet iron pipe of two inches diameter, having in it several convolutions before it left the room. So completely was the heat generated in the process of combustion dissipated by the pipe, and emitted into the room, that a thermometer, the bulb of which was inserted in the pipe just before it entered the chimney, indicated the same temperature as the one which hung in the room. As the conducting power of air, in relation to caloric, is influenced by its hygrometric state, care was taken to preserve it in a uniform condition in this respect. All the varieties of fuel operated on were dried previous to combustion, at a temperature of 250°, Fahrenheit. Their solid contents were determined in the usual method for irregular bodies, by the volume of water which a given volume

Woods and Coals.		Specific gravities of dry wood.	Avoird. lbs. of dry wood in 1 cord.	Product of charcoal from 100 parts dry wood, by weight.	Specific gravities of dry coal.	Pounds of dry coal in one bushel.	Lbs. charcoal from 1 cord of dry wood.	Bushels of charcoal from 1 cd. dry wood.	Time 10° Heat were maintained by the combustion of 1 lb. of each article.	Value of specified quantity of each article, compared with shell bark hickory.
Common Names.	Botanical Names.								H. M.	Cord.
White Ash	Fraxinus americana	.772	3450	25.74	.547	28.78	888	31	6 40	77
Apple Tree	Pyrus malus	.697	3115	25	.445	23.41	779	33	6 40	70
White Beech	Fagus sylvestris	.724	3236	19.62	.518	27.26	635	23	6	65
Black Birch	Betula lenta	.697	3115	19.40	.428	22.52	604	27	6	63
White Birch	Betula populifolia	.530	2369	19	.364	19.15	450	24	6	48
Butter-nut	Juglans cathartica	.567	2534	20.79	.237	12.47	527	42	6	51
Red Cedar	Juniperus virginiana	.565	2525	24.72	.238	12.52	624	50	6 40	56
American Chesnut	Castanea vesca	.522	2333	25.29	.379	19.94	590	30	6 40	52
Wild Cherry	Cerasus virginiana	.597	2668	21.70	.411	21.63	579	27	6 10	55
Dog Wood	Cornus florida	.815	3643	21	.550	28.94	765	26	6 10	75
White Elm	Ulmus americana	.580	2592	24.85	.357	18.79	644	34	6 40	58
Sour Gum	Nyssa sylvatica	.703	3142	22.16	.400	21.05	696	33	6 20	67
Sweet Gum	Liquidumbar styraci flua.	.634	2834	19.69	.413	21.73	558	26	6	57
Shell-bark Hickory	Juglans squamosa	1.000	4469	26.22	.625	32.89	1172	36	6 40	100
Pig-nut Hickory	Juglans porcina	.949	4241	25.22	.637	33.52	1070	32	6 40	95
Red-heart Hickory	Juglans laciniata ?	.829	3705	22.90	.509	26.78	848	32	6 30	81
Witch Hazel	Hamamelis virginica	.784	3505	21.40	.368	19.36	750	39	6 10	72
American Holly	Ilex opaca	.602	2691	22.77	.374	19.68	613	31	6 20	57
American Hornbeam	Carpinus americana	.720	3218	19	.455	23.94	611	25	6	65
Mountain Laurel	Kalmia latifolia	.663	2963	24.02	.457	24.05	712	30	6 40	66
Hard Maple	Acer saccharinum	.644	2878	21.43	.431	22.68	617	27	6 10	60
Soft Maple	Acer rubrum	.597	2668	20.64	.370	19.47	551	28	6	54
Large Magnolia	Magnolia grandiflora	.605	2704	21.59	.406	21.36	584	27	6 10	56
Chesnut White Oak	Quercus prinus palustris.	.885	3955	22.76	.481	25.31	900	36	6 30	86
White Oak	Quercus alba	.855	3821	21.62	.401	21.10	826	39	6 20	81
Shell-bark Wh. Oak	Quercus obtusiloba ?	.775	3464	21.50	.437	22.99	745	32	6 20	74
Barren Scrub Oak	Quercus catesbæi	.747	3339	23.17	.392	20.63	774	38	6 30	73
Pin Oak	Quercus palustris	.747	3339	22.22	.436	22.94	742	32	6 20	71
Scrub Black Oak	Quercus banisteri	.728	3254	23.80	.387	20.36	774	38	6 30	71
Red Oak	Quercus rubra	.728	3254	22.43	.400	21.05	630	30	6 20	69
Barren Oak	Quercus ferruginea	.694	3102	22.37	.447	23.52	694	29	6 20	66
Rock Chesnut Oak	Quercus prinus monticola	.678	3030	20.86	.436	22.94	632	28	6	61
Yellow Oak	Quercus prinus acuminata	.653	2919	21.60	.295	15.52	631	41	6 10	60
Spanish Oak	Quercus falcata	.584	2449	22.95	.362	19.05	562	30	6 20	52
Persimon	Diospyros virginiana	.711	3178	23.44	.469	24.68	745	30	6 30	69
Yellow Pine (soft)	Pinus mitis	.551	2463	23.75	.333	17.52	585	33	6 30	54
Jersey Pine	Pinus inops	.478	2137	24.88	.385	20.26	532	26	6 40	48
Pitch Pine	Pinus rigida	.426	1904	26.76	.298	15.68	510	33	6 40	43
White Pine	Pinus strobus	.418	1868	24.35	.293	15.42	455	30	6 40	42
Yellow Poplar	Lyriodendron tulipifera	.563	2516	21.81	.383	20.15	549	27	6 10	52
Lombardy Poplar	Populus dilatata	.397	1774	25	.245	12.89	444	34	6 40	40
Sassafras	Laurus sassafras	.618	2762	22.58	.427	22.47	624	28	6 20	59
Wild Service	Aronia arborea	.887	3964	22.62	.594	31.26	897	29	6 20	84
Sycamore	Acer pseudo-platanus	.535	2391	23.60	.374	19.68	564	29	6 30	52
Black Walnut	Juglans nigra	.681	3044	22.56	.418	22	687	31	6 20	65
Swamp Whortleb'rry	Vaccinium corymbosum	.752	3361	23.30	.505	26.57	783	29	6 30	73
										Ton.
Lehigh Coal		....	....	.....	1.494	78.61	....	....	13 10	99
Lackawaxen Coal		....	....	.....	1.400	73.67	....	....	13 10	99
Rhode Island Coal		....	....	.....	1.438	75.67	....	....	9 30	71
Schuylkill Coal		....	....	.....	1.453	76.46	....	....	13 40	103
Susquehanna Coal		....	....	.....	1.373	72.25	....	....	13 10	99
Swatara Coal		....	....	.....	1.459	76.77	....	....	11 20	85
Worcester Coal		....	....	.....	2.104	110.71	....	....	7 50	59
										100 bbls
Cannel Coal		....	....	.....	1.240	65.25	....	....	10 30	230
Liverpool Coal		....	....	.....	1.331	70.04	....	....	9 10	215
Newcastle Coal		....	....	.....	1.204	63.35	....	....	9 20	198
Scotch Coal		....	....	.....	1.140	59.99	....	....	9 30	191
Karthaus Coal		....	....	.....	1.263	66.46	....	....	9 20	208
Richmond Coal		....	....	.....	1.246	65.56	....	....	9 20	205
Stony Creek Coal		....	....	.....	1.396	73.46	....	....	9 50	243
Hickory Charcoal		....	....	.....	.625	32.89	....	....	15	166
Maple Charcoal		....	....	.....	.431	22.68	....	....	15	114
Oak Charcoal		....	....	.....	.401	21.10	....	....	15	106
Pine Charcoal		....	....	.....	.285	15	....	....	15	75
Coke		....	....	.....	.557	29.31	....	....	12 50	126
Composition of two parts Lehigh Coal, one Charcoal, and one Clay, by weight		....	....	.....	....	.....	....	....	13 20	

by the usual admeasurement displaces, and the specific gravities by the hydrostatic balance. In the latter case, porous substances, which expand by the absorption of water, as the wood, were previously covered with a varnish having exactly the same specific gravity as water; in short, no precaution seems to have been omitted by this laborious and able experimenter, to guard against every source of error, both in the construction of his apparatus, and in the general conduct of his inquiries. The annexed table exhibits the results of his experiments on sixty-six varieties of fuel. (See opposite page.)

On the first inspection of the foregoing table I was surprised, as I presume others have been, at the general aspect of the 10th column in relation to the wood. The difference in the heat produced by the combustion of equal weights of dry woods is much less than I had apprehended, and such as to induce a momentary suspicion of the general accuracy of the results. The extreme times in which given weights of forty-six varieties of dry woods sustained a temperature, in the inner room, of 10° above the surrounding medium, are only as 9 to 10. If we turn to the 5th column, we observe a remarkable coincidence between the weight of charcoal, which each variety of wood yields, and the heat produced by combustion. This correspondence is noticed by Mr. Bull. It is not exact, but sufficiently so to justify the inference, that the small difference in the actual value of fuel, as determined by the heat emitted on combustion, is mainly attributable to variations in the quantity of carbon they contain. As the results in these two columns were obtained by actual experiment, and by processes entirely dissimilar, the coincidence noticed affords a strong confirmation of the general correctness of both.

The eight first columns of figures, in the above general table, contain the results of actual experiments, for the details of which I must refer the reader to Mr. Bull's work. The last column is obtained by calculation. Mr. Bull found that shell-bark hickory has the greatest specific gravity of all the varieties of wood experimented on, (as indicated in the table;) and, as an equal weight of it was observed to maintain a given temperature in the room as long a time as any other, it follows that a cord of this wood would yield the greatest amount of heat in combustion: assuming, therefore, the specific gravity of shell-bark hickory to be 1.000, and its value as 100, the value of the other woods must be in the compound ratio of their respective specific gravities, and the time which a given weight was found to sustain the required temperature, and is given in decimal expressions of this last number. On this subject Mr. Bull observes, "that although shell-bark hickory has been taken, for convenience, as the standard to construct the column of comparative values, the economist should take the cheapest article of fuel in the market, as his standard of comparison."

If we assume the average quantity of charcoal yielded by the dry woods to be 20 *per cent.* by weight, and the average time that a pound of dry wood sustained a temperature of 10° above the surrounding medium, in Mr. Bull's experiments, to be six hours (both of which terms are below the truth, but which sustain to each other about the ratio which we observe between the 5th and 10th columns in his table,) it results that just 50 *per cent.* of the heat emitted in the combustion of dry wood is to be attributed to the combustion of the carbon which it contains: for one pound of charcoal sustained the temperature of the room, at the required point, just two and a half times as long as the assumed average time that a pound of wood would do, which yields 20 *per cent.* of charcoal, and $.20 \times 2.5 = .500$.

The following remarks of Mr. Bull are full of interest to the economist of fuel. "From experiments made to ascertain the weight of moisture absorbed by the different woods, which had previously been made perfectly dry, and afterwards exposed in a room in which no fire was made during a period of twelve months, the average absorption by weight, for this period, was found to be 10 *per cent.* in forty-six different woods, and 8 *per cent.* in the driest states of the atmosphere; and an unexpected coincidence was found to exist in the weight absorbed by forty-six pieces of charcoal, made from the same kinds of wood, and similarly exposed, the latter being also 8 *per cent.*

"The quantity of moisture absorbed by the woods individually was not found to

diminish with their increase in density; whilst it was found that the green woods in drying uniformly lost less in weight in proportion to their greater density. Hickory wood, taken green, and made absolutely dry, experienced a diminution, in its weight, of 37½ *per cent.*, white oak 41 *per cent.*, and soft maple 48 *per cent.* A cord of the latter will, therefore, weigh nearly twice as much when green as when dry.

"If we assume the mean quantity of moisture in the woods, when green, as 42 *per cent.*, the great disadvantage of attempting to burn wood in this state must be obvious; as in every 100 pounds of this compound of wood and water, 42 pounds of aqueous matter must be expelled from the wood, and as the capacity of water for absorbing heat is nearly as 4 to 1 when compared with air, and probably greater during its conversion into vapor, which must be effected before it can escape, the loss of heat must consequently be very great.

"The necessity of speaking thus theoretically, upon this point, is regretted; but it will be apparent that this question of loss cannot be solved by my apparatus, as the vapor would be condensed in the pipe of a stove, and the heat would thereby be imparted to the room, which, under ordinary circumstances, escapes into the chimney."

If we adopt the statement of Mr. Tredgold, that 8.40 pounds of Newcastle coal will convert one cubic foot, or 62½ pounds, of water, into steam, under common pressure of the atmosphere, which is probably correct, Mr. Bull's table furnishes the remaining necessary *data* for a more accurate determination of the loss sustained in burning green wood. Take, for example, 100 pounds of green white oak, which Mr. Bull found to contain 41 pounds of moisture: according to Mr. Tredgold, 41 pounds of water require 5.51 pounds of Newcastle coal for conversion into vapor. Now we have the relative values of oak wood and Newcastle coal, as it regards their power of producing heat, in the 10th column of Mr. Bull's table: 1 pound of white oak maintained 10° of heat in the room six hours and twenty minutes, and one pound of Newcastle coal nine hours and twenty minutes. We have then this proportion, as 380′: 560′:: 5.51: 8.12 pounds of dry oak, consumed in converting 41 pounds of water into steam; or, in other words, 13¾ *per cent.* of the combustible matter of green oak is employed in boiling away its own water, and, in all ordinary cases, is a dead loss. It is true that arrangements might be made by a very protracted iron pipe, as in the stove used by Mr. Bull in his experiments, and other contrivances, for condensing the steam thus formed from green wood, and recovering both the latent and the sensible heat of the steam; but such an apparatus would be attended with too many inconveniences to be adopted in our dwelling houses, and would be perfectly impracticable in large fires in the arts, where the flue is necessarily kept at a temperature above boiling water, and where, of course, the steam could not condense.

In the foregoing estimate of the loss of heat by the combustion of green wood, I have considered the subject in a theoretical point of view; or, at least, only in relation to those operations which have for their object the diffusion of heat in the air of apartments. But in most of the arts the object is the reverse of this,—to produce a strong and *circumscribed* heat. In these cases there is not only an entire loss of that portion of caloric which escapes in the steam from most fuel, (for it cannot be recovered, even if subsequently condensed, to any efficient purpose,) but if the temperature fall, in consequence of this loss of caloric in the steam, below the required point, there must be a total loss of the whole fuel. I suspect that it would be quite impossible for our glass manufacturers and iron founders to procure the intense heat required in their furnaces with the use of green wood. I have noticed at several glass-houses, and the practice is probably general, that the weather seasoned pine wood is dried, or rather baked, by a stove heat, at a temperature that not unfrequently ignites it before it is used. I think it not unlikely that this practice might, in many instances, be profitably extended to the ordinary fuel (pine wood) used for steam boilers in our river boats; or, in other words, that a portion of the fuel might be economically expended in drying the remainder preparatory to use. Mr. Bull estimates the average quantity of moisture, in woods

which have been weather seasoned from eight to twelve months, at about 25 *per cent.* of their weight. It may be objected to this suggestion, that although stove-drying may be indispensable where the attainment of a certain high degree of heat is absolutely necessary to the success of the process, yet where this necessity does not exist, the water may be as cheaply dissipated by the absorption of the caloric in the ordinary combustion, as by burning a portion of the fuel separately for that object. To this it may be replied, that the effective heat imparted to steam boilers is not, as is generally supposed, in a direct ratio to the quantity of caloric emitted by the burning fuel, but more nearly in proportion to the elevation of the temperature in the fire-place above that of the water within the boiler. The vapor formed by a fire that shall only elevate the temperature of the water to within a few degrees of the boiling point, say to 200°, bears a very small proportion to that which is produced at 212°; so that it is quite easy to burn a considerable quantity of fuel under a boiler to almost no practical effect. To pursue this subject into the causes of these results would lead to a theoretical disquisition on the laws which govern the communication of heat, foreign to the object of this work.

The great superiority assigned by Mr. Bull to the Lehigh and other anthracite coals, not only over wood but the best English coals, has also excited some doubt, and particularly with us at the north, of the accuracy of the comparison; but this, it may reasonably be supposed, is attributable to a mistake, against which Mr. Bull has warned us in his treatise, that of comparing his results with common experience derived from the very imperfect arrangements for the consumption of this fuel, both in the arts and in our dwellings. Its introduction is of too recent a date to have diffused correct information on this subject, and doubtless we have yet much to learn as to the best methods of applying it to many purposes in the arts.

"The composition balls of Lehigh coal, charcoal, and fire clay," Mr. Bull observes, "were made for the purpose of ascertaining whether a very economical fuel might not be formed of the culm, or fine portions, of the two former, by combining them with the latter article, as they possess very little value: the same practice having been adopted with considerable advantage in various parts of Europe. The fire produced by these balls was found to be very clean and beautiful in its appearance. Its superior cleanliness is in consequence of the ashes being retained by the clay, and the balls were found to contain their original shape after they were deprived of the combustible materials. The beauty of the fire is enhanced by the shape and equality in the size of the balls, which during the combustion present uniform luminous faces. No difficulty was found in igniting, or perfectly comsuming, the combustible materials, and the loss in heat, when compared with the combustion of the same quantity of each article in their usual states of aggregation, was found to be only three per cent." I think there must be an error, probably a typographical one, in carrying out the result of the combustion of this mixture in Mr. B.'s table: allowing the anthracite and charcoal to yield the same heat as assigned to them when burned separately in the aggregate form, they should have sustained the same temperature only ten hours and twenty minutes.]

Fire from Ashes. — Some time in the month of November, passing a neighbor's barn, we discovered the straw on the dung heap, which was heaped up against the barn, to be on fire. In a few minutes the building would have been in flames. The fire was occasioned by hot ashes thrown on the heap. The following spontaneous combustion from ashes is from a lecture on heat, by Prof. Smith, formerly of New-Haven.

"Perhaps there are few people who are acquainted with the fact that ashes made by burning hard wood, such as ash, maple, &c., in a fire place, and taken up dry, are capable of producing spontaneous combustion, simply by receiving a degree of moisture, or by coming in contact with a wet board or stave, or being exposed to a very damp atmosphere. It is generally believed when fire is kindled by ashes, that it is caused by coal being put away with the ashes while on fire; but this is a mistake. The coals, if they were on fire, when buried in ashes, and excluded from atmospheric air, would soon be extinguished, or if they were not, they could not kindle fire with

the atmospheric air excluded. The spontaneous combustion of ashes proceeds from a very different principle.

"Hard wood ashes, when they are first made, and while they are kept dry, contain a metal called potassium, which is the basis of potash. This metal is very combustible, and has so strong an affinity or attraction for oxygen, the supporter and cause of combustion, that it takes oxygen from water, the moment that it touches it, and burns with a vivid flame, and the product of this combustion is potash, that is, potassium saturated with oxygen, or what may be called the oxide of potassium. It should be noticed, too, that water is a compound of oxygen and hydrogen, and that when the potassium comes in contact with water, it takes the oxygen from it, and the hydrogen being set free increases the combustion. The simple explanation then is this: dry ashes, when first burnt, contain in them a metallic substance, which is highly inflammable, and which is set on fire by moisture. Quick lime and water produce heat sufficient, in some instances, to set wood on fire, but ashes and water produce a much more intense heat. In adding water to ashes there is a real combustion of the metal contained in the ashes; the metal being a combustible substance, requiring nothing but the oxygen of water to set it on fire."—[N. Y. Farmer.]

[From the American Railroad Journal.]

The following very important communication has been furnished us for publication. It exhibits the value of our works of internal communication in a new and more clear light than it has hitherto been. By this statement (made, it is true, only in part from documents, but it is believed that the estimate of 33⅓ tons to each lockage is entirely within the truth,) it will be perceived that the amount of tonnage in 1834, on the Erie Canal alone, which passed Alexander's lock, exceeds the whole amount of tonnage, both *foreign and domestic*, of the Port of New-York for 1833.

The immense and increasing trade on our Erie Canal almost exceeds belief, and will readily account for the steady advance in Real Estate in this city since its completion. Few would imagine that the tonnage passed and repassed at one lock on the Erie Canal, Alexander's, west of Schenectady, in the business season of seven and a half months, exceeds the entire tonnage, foreign and domestic, which entered and cleared at this custom-house during the year 1833, and will fully equal, if not exceed, the tonnage entered and cleared in 1834, the last quarter of which is not yet made out by the Collector.

I annex you a statement furnished by the Collector, by which it appears, that for the four quarters of 1833, there were

	Tonnage and Register.
553 Foreign Arrivals	110,835 tons
1365 Domestic Arrivals	320,083 "
512 Foreign Clearances	101,512 "
1026 Domestic Clearances	239,416 "
Whole number loaded and in ballast	771,846 "

Statement of the number of *American* and *Foreign vessels*, and their *tonnages*, entered and cleared from the Port of New-York in 1833, and the first three-quarters of 1834.

Date.	*Foreign Arrivals.*		*Domestic Arrivals.*		*For'gn Clearances.*		*Domes. Clearances.*	
	No. of vessels	Tons.	No. of vessels	Tons.	No. of vessels	Tons.	No. of vessels	Tons.
First Quarter, 1833	53	11,599	251	57,374½	53	12,396½	227	51,304
Second " "	167	35,113	438	101,433½	138	27,225	280	63,182½
Third " "	212	40,740½	374	90,299½	202	41,062½	269	67,087½
Fourth " "	121	23,382½	302	70,976½	119	20,828½	250	57,841
	553	110,835	1365	320,083½	512	101,512½	1026	239,415½
	1365	320,083½	—	—	1026	239,415½	—	—
In 1833	1918	430,918½			1538	340,927½		
First Quarter, 1834	43	8,959	309	68,284½	58	11,115½	241	52,901½
Second " "	178	42,754	444	101,733	142	32,166	295	68,032
Third " "	142	25,962	406	101,642	155	32,050	227	54,114
Fourth—not ascertained.								
	363	77,675	1159	271,659½	355	75,331½	763	175,047½
	1159	271,659½			763	175,047½		
In 1834, (in part,)	1522	349,334½			1118	250,378½		

The official statement of the boats and floats of timber passed at Alexander's lock, is not yet published; but to the first of September it was 12,551, and it is understood to exceed 24,000 to the close of navigation, equal to a lockage every 12½ minutes, day

and night, during the season of navigation; and only allowing the moderate ratio of 33⅓ tons to a lockage of boat or float of timber, it will give 800,000 tons, without taking into view the large amount of trade in salt, wheat, and lumber, between Buffalo and Alexander's lock.

But, to set the question at rest, I present you with the Collector of Utica's official statement of the comparative view of the property passed Utica on the Erie Canal, in the years 1833 and 1834. By this table you will ascertain that 420,000 tons weight actually floated by Utica during the season of navigation, seven and a half months, which will fully equal the weight carried by the 1918 vessels entered and cleared at this Custom House, when it is taken into consideration that more than one-third returned in ballast, or were only partially loaded.

COLLECTOR'S OFFICE.

Utica, December 26, 1834.

Comparative statement of property that passed Utica on the Erie Canal in the years 1833 and 1834.

Articles.	1833.	1834.	Increase.
Staves.....No.	9,264,523	10,416,705	1,152,182
Flour.....brls.	967,813	1,157,059	189,246
Provisions.....	27,919	39,888	11,969
Salt.....	62,860	70,060	7,200
Ashes.....	29,508	30,502	994
Beer.....	586	638	52
Cider.....	284	622	338
Woods.....cords	4,808	5,383¼	575¼
Wheat...bushels	1,175,423	1,197,304	21,881
Coarse Wool.lbs.	1,666,673	1,135,225	31,448
Bran & ship stuffs.....brls.	300,518	349,303	48,785
Grain....bushels	320,578	402,216	99,638
Clover & Grass Seed.....lbs.	1,460,628	2,144,551	683,923
Cheese.....	1,857,944	3,173,147	1,315,203
Hops.....bales	443,236	487,580	44,344
Fur & Peltry.lbs.	268,521	399,832	131,611
Stone.....	8,805,039	16,619,735	7,814,696
Clay.....	1,821,565	2,351,153	529,588
Pig Iron.....	1,810,215	2,005,158	194,943
			Decrease.
Dom.Spirits.gals.	1,609,612	1,461,051	148,561
Timber.....feet	1,733,255	1,522,637	210,618
Boards & scantling	40,804,371	38,290,991	2,513,380
Shingles.....M.	55,287	41,061	14,226
Lime.....,brls.	15,357	6,105	9,252
Gypsum.....lbs.	8,750,501	10,615,023	8,135,478
Butter & Lard....	4,554,215	4,499,008	55,207
Merchandize....	157,357,547	140,743,996	16,613,551
Furniture.....	7,595,732	10,672,802	3,077,070
Coal.....	6,423,090	4,551,960	1,871,130
Dried Fruit...lbs.		50,376	
Sundries.....		3,458,190	
Iron Ware.....		1,439,211	
Bar & Pig Lead..		30,300	
Flax Seed.....		1,221,102	
Tobacco.....		538,840	
Hemp..... ...		1,765.882	
Cotton.....bales		77,891	
Apples.....bush.		729	
Potatoes.		4,809	
Peas & Beans....	8,260	29,486	

The foregoing account is from the 17th April last, to the 25th inst. inclusive, during which period there was collected at this office for Tolls, &c. $52,266 44.

In the above account for 1834, it will be perceived there are a number of articles that do not appear in that for 1833; this is owing to there not having been any account kept of these articles, in consequence of there not being any heading for them on the blanks for that year. Of the decrease in Merchandize, about 4,550,000 lbs. is accounted for, by articles heretofore placed under that head having a heading for them in the blanks for this year. Respectfully, your ob't servant,

THOMAS M. FRANCIS.

By this interesting table it will be perceived that 1,157,059 barrels flour passed Utica, which, with 1,197,304 bushels of wheat, are equal to 1,425,000 barrels of flour, equal in value, delivered at this port, to seven and a half millions of dollars. Of cotton, we perceive 1,221,102 lbs. passed. Merchandize, 140,743,996 lbs.—which, with the other items in this statement, must exceed fifty millions of dollars, valuing the merchandize at only $300 per ton.

It will be noted that the high tolls have decreased the amount of lumber, particularly ship timber, an important item to the landed interest in the interior. J. E. B.

[From the American Railroad Journal.]

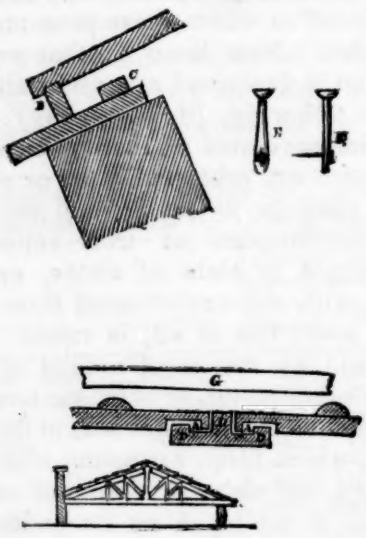
Specification of the Patent granted to WILLIAM NORTH, *of Stangate, Lambeth, in the County of Surrey, Slater, for an Improvement in Roofing or Covering Houses and other Buildings or Places.*—Sealed January 29, 1833.

To all to whom these presents shall come, &c. Now know ye that my said invention is described and ascertained in manner following, (that is to say):

My improvement in roofing or covering houses and other buildings or places, partly consists in laying and retaining upon the wooden or iron rafters of roofs, slates or slabs of slates, each of which, with the exception of those used in the lower tier of all, is raised at its lower end by means of a fillet of slate, lead, or other metal, or of mastic composition attached to the under side of the slate or slab, which fillet, excepting when laid on slates, or slabs of slates of uneven surface, is scolloped on its under side, more or less, as may be required, so as to admit air from without to the timbers of the roof, and to let steam, heat, and damp, escape from within. My said improvement further consists in laying or retaining upon the wooden or iron rafters of such roofs, slates or slabs of slate, each of which, with the exception of those used in the upper tier of all, has attached to the top side of the upper end of each, a fillet of slate, lead, or other metal, or of

mastic composition, smaller than the fillet before described, and the upper end of the slate, or slab, to which the smaller fillet is attached, being overlapped by the lower end of the slate or slab to which the larger fillet is attached, the smaller fillet excludes wet from without, while it does not prevent the air from being admitted to the timbers of the roof from without, or steam, heat, or damps, escaping from within, which completes the horizontal joints. Further, on the under side of each slate or slab, a groove is sunk at each side, the outer edges of which overlap the edges of a slate, or iron bearer, which has a corresponding groove sunk on each side of its upper surface, forming a channel for the discharge of wet that may get into the vertical joint.

And in order that this my specification may be sufficiently clear to enable competent persons, at the expiration of my patent, to practise my invention with the same advantage which I myself now possess, I shall describe the whole process of roofing, or covering houses, and other buildings or places, in the manner which I practise.



Description of Drawing.—The slates or slabs of slate are in thickness from 7-8 inch to 1 inch, according to the strength required, in length from 2 feet to 6 feet, the breadth about two-thirds the length. On the under side of each slate or slab, is a groove at each of its sides about 3-4 inch wide and 1-4 inch deep, fig. No. 1, A, A.

On the under side of the lower end of each slate, excepting those used in the bottom tier, or eave course, is a groove 3-8 inch and 1-8 inch deep, into which is fastened a fillet of slate, lead, or other metal, about 3-8 by 5-8 inch, by means of a seam of mastic or oil cement, having its bottom edge scolloped according as little or much ventilation is required, or not scolloped if the face of the slate upon which it bears is of uneven surface, fig. No. 2, B. And upon the upper side of the top end of each slate, (excepting those used in the upper tier of all,) is laid a fillet of mastic or other composition, or of slate, lead, or other metal, about ½ inch wide, ¼ inch thick, fig. No. 2, C: observing, that I generally use a fillet of lead for the bottom end, on account of its exposure to the weather, and its flexible quality in bending to the unevenness of the slate, and a fillet of mastic for the top end on account of its adhesive quality to the slate, and being partly protected from the weather. The bearers upon which the sides of the slates or slabs bear, forming the vertical joints, are of slate or iron, from 1 to 2 inches thick, of the same length as the slates, and about 3 inches wide, with a groove about ½ inch wide and ½ inch deep on each side of the upper face, fig. No. 1, D, D, D.

Method of fixing the improved roofing.—The wooden or iron rafters must be placed horizontally, of sufficient distance apart to allow of the top end of the slates having 2 inches bearing, and the bottom end to overlap the slate below 2 inches, the principals or binders are about 8 feet apart. The slate or iron bearers are sunk and nailed at the upper ends, a sufficient depth into the rafters to allow of the slates or slabs bearing equally upon the rafters and upon the bearers, the bottom-end overlapping the head of the slate below 2 inches, and the sides of the slates or slabs overlapping the sides of the bearers, fastened at the bottom-ends with metal loops, E, E, countersunk into the face of the slate, and nailed to the rafters.—In witness whereof, &c.

Enrolled July 29, 1833.

[From the Report of the Kennebec Agricult'l Society.]

PITTS' HORSE POWER AND THRASHING MACHINE.—We were next summoned to examine Pitts' improved Horse Power and

Thrasher. This is an improvement invented and patented by Messrs. J. A. and H. A. Pitts, of Winthrop, and your committee think that a very considerable improvement has been effected by them. The principle is on the plan of the Endless Chain—but the horse travels upon wood, and the logs are kept from sagging by a new and ingenious application of a system of rolls, called by the inventors "surface rolls." The improvements appear to be—1. A greater ease for the horse; 2. Less weight in the machine; 3. Less expense to the purchaser. It can be easily made, with slight additional expense, for two horses. It thrashes clean, and on the whole is a valuable implement for the farmer. We think the Messrs. Pitts richly entitled to a gratuity for introducing their improvement among us.

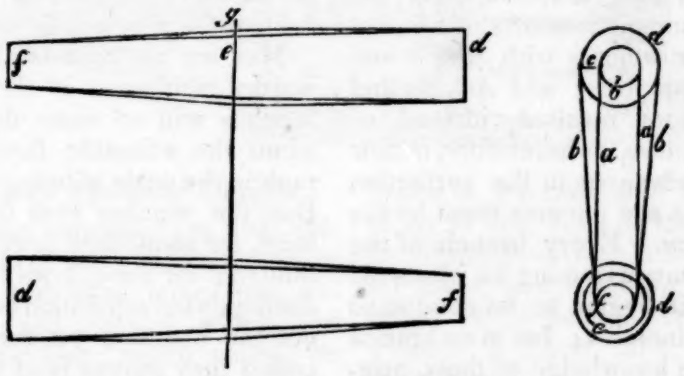
PULLEN'S METALLIC WASH-BOARD.—A new invention for washing was presented by Mr. J. Pullen, of China. This consisted of a plate of copper or zinc, fluted in the form of our common wash-boards, and affixed to a board of suitable size. This invention is neat, smooth, and durable; and the Chairman of the Committee, having used it in his family, can cheerfully recommend it to the public as being a useful implement—not wearing rough nor rusting. We would recommend that a gratuity be given Mr. Pullen for his invention.

Cone Drums.

To the Editor of the Mechanics' Magazine:

SIR—It is well known by mechanics and manufacturers, that it is necessary, in many cases, to vary the motion or speed of machinery, such as lathes or engines for turning, and machines for drilling, &c. according to the magnitude of the work to be performed; which may be done by two cone drums, of suitable length and bigness, placed parallel to each other, and the large end of one with the small end of the other, and coupled together with a belt—a moveable belt, that may be moved backward and forward the length of the drums by two guides connected to a sliding rod fitted for the purpose; and by moving said belt the motion of the machine may be varied.

It is also known by many, that if these drums are made a straight taper, the belt, when made tight at the ends, will be loose in the middle; consequently, they should be sufficiently curved to have the belt set with equal tightness from end to end. Now, the question is, how much must this curve be? There are but few mechanics that can perform it, only by the good old rule, "cut and try," which seems not to be just the thing; I have, therefore, adopted a system of calculation which will solve the question by a mathematical process, and will answer equally as well in practice as in theory, which will save much time and expense in making and putting them up, in such a manner as to have the belt traverse freely, and with equal tightness.



We will then suppose the centres of the drums to be three feet from centre to centre, which distance we will call *a*. We will also suppose the large end 12 inches, and the small end 6 inches diameter, which we will call *d* and *f*, and the half difference of the diameters, which is three inches, we will call *c*; then we have the base *a*, and the perpendicular *c*, of a triangle, given to find the hypothenuse, *b*, by the rule which is subjoined:

"The square root of the sum of the squares of the two sides is the hypothenuse."

Then, by the rule, $\sqrt{a^2 + c} = 6 =$ 36·29 hypothenuse.

Then, as 7 : 22 : : *d* or 12 : 37·714 = circumference of *d*, and as 7 : 22 : : *f* or 6 : 18·357 = circumference of *f*,

$d + f = 56{\cdot}571$; and $28{\cdot}285$ = half sum, or a medium between d and f, and $b - a = 0{\cdot}29$, difference between a and b; $28{\cdot}285 + 0{\cdot}29 + 0{\cdot}29 = 28{\cdot}865$, required circumference e. Then, as 22 : 7 : : 28·865 : 9·174, required diameter of e; and $9{\cdot}174 - 9 = 0{\cdot}174$ = curve in centre, or g, e.

I send the above diagrams, which you may insert or not, as you please; but I think it will help many of your readers to understand the principle as above laid down, by inserting it. S. A.

We should be pleased to hear often from S. A.—[Ed. M. M.]

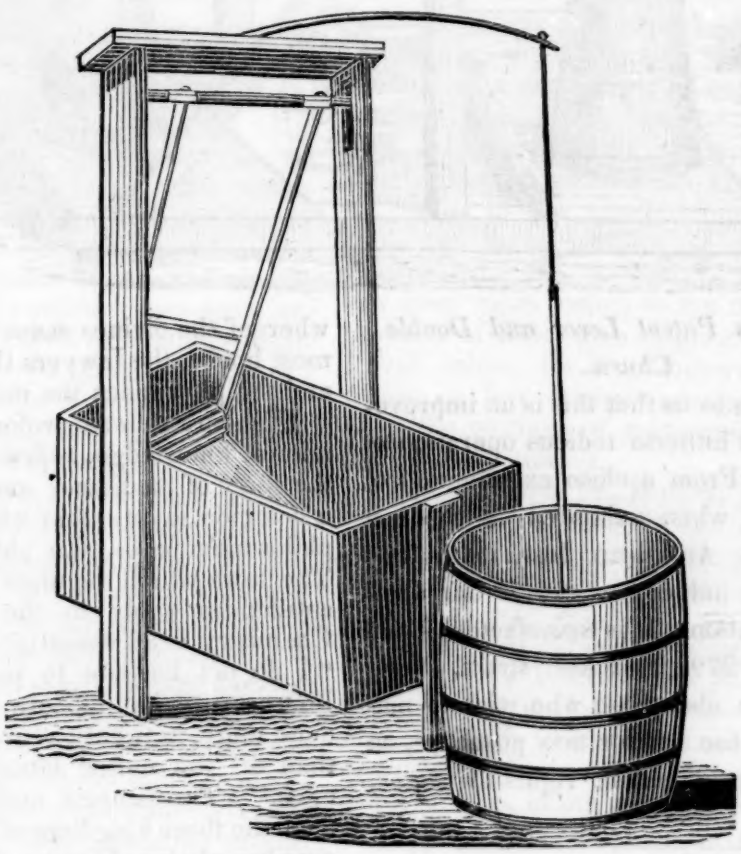
The Advantages attending the Farmer's Occupation.—From an excellent address, delivered by S. Blydenburgh, before the first annual meeting of the Rensselaer Agricultural Society, we extract the following.

Science and art, which were designed by Nature as twin sisters, for the mutual benefit and support of each other, have been from time immemorial alienated and estranged by the artifices of designing men. But, thank Heaven! they are becoming happily reconciled. Science, tired of spinning hypothetical cobwebs in secret, has at length found out that she is indebted to her long despised sister, not only for the common comforts of life, but even for the instruments with which she makes her discoveries; and *Art*, finding herself no longer insulted, instead of groping in darkness, as heretofore, is now making rapid advances in the perfection of her labors, as she pursues them by the light of science. Every branch of the useful arts is now assuming an improved character, as it begins to be conducted on scientific principles; but in no branch whatever is the knowledge of those principles of more importance than in agriculture.

The same overbearing spirit, which has heretofore monopolized all the honors, all the respectability, and most of the wealth, has endeavored, and still endeavors, to claim all the learning. We have two or three professions, which, however necessary, (and I have no disposition to question either their usefulness or their respectability,) cannot produce a single article even for their own subsistence, but which are with great emphasis styled the *learned* professions; while the farmer who feeds them, and who furnishes the materials to clothe them, is in grateful return greeted by the sweet-sounding appellation of clodhopper. There can be no shadow of objection to giving learning to the man who labors for our spiritual good—to the lawyer, who settles our temporal disputes—or to the physician, who heals our maladies. But why, in the name of common sense, is it not equally necessary for the farmer? I would not dispute with either of these learned professions for the monopoly of the dead languages, but for the ever-living natural sciences—for mathematics, mechanics, chemistry, botany, and zoology, and their subordinate branches. I contend that where the clergyman, or the lawyer, has one professional occasion for their use, the farmer has fifty. By botany and chemistry, he learns the physiology of his plants, the nourishment and treatment they require; and, by analyzing his soil, he discovers what is necessary to maintain and increase its fertility. Zoology and natural history teach him the characters and constitution of his animals; and mechanics, the structure and use of his implements. In short, his whole business of life is a series of illustrations of the principles of science, and his whole establishment is a scientific laboratory.

May we not confidently hope that the worthy gentlemen of these learned professions will at some day be willing to admit the scientific farmer to an equal rank in the scale of being with themselves? But the number thus favored, however, must, for some time to come, remain very limited; for though we have colleges of distinguished reputation dispersed throughout the country, yet the course of education they pursue is of too abstract a nature to be of any essential service to the interest of agriculture. There can be no doubt that those who have no faith in book farming will smile at the idea of a college-learnt farmer. But how many things have been smiled at as ridiculous at one period, and at a subsequent period hailed and applauded as wonderful improvements? We have theological seminaries, and medical seminaries, and law

seminaries, and military seminaries, and each endowed with splendid and costly libraries, and all the paraphernalia of scientific illustration and experiment, and furnished with able teachers, liberally supported. But poor agriculture, whose hand sows the seed, and whose arm gathers the harvest and the vintage, on which all our earthly comforts and even our very existence depends, she can have no seminary in which to teach her sons the most valuable of all arts. No matter—they are nothing but clod-hoppers; if they can learn their letters and read the bible, what more can they want to know? Even our wise legislatures can grant supplies for literary and other public institutions with a liberality which does them great credit, but touch the string of agriculture, and it refuses to vibrate; the whole instrument seems paralized and makes no music.

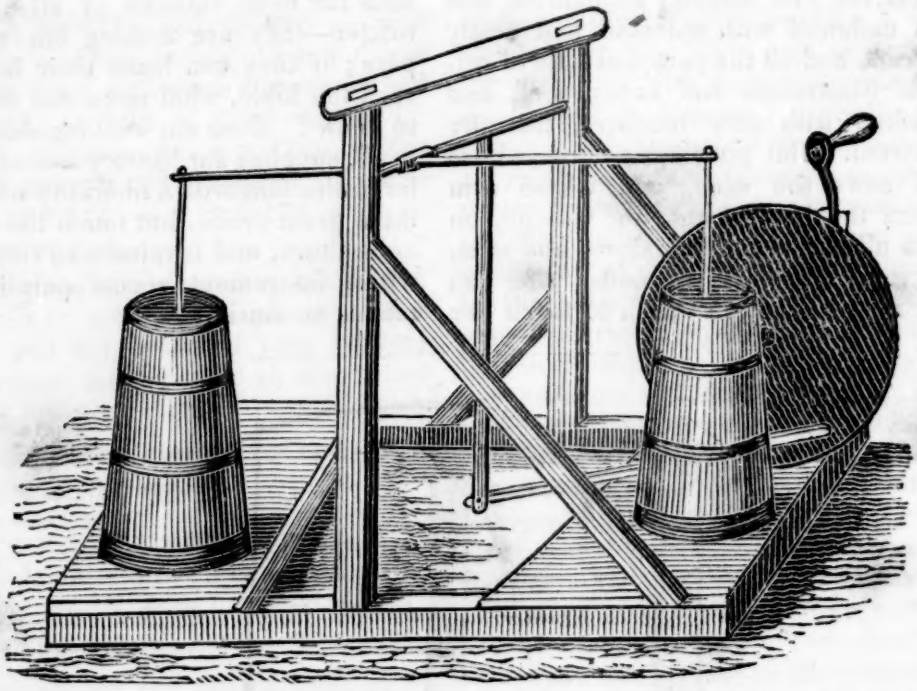


Angevine's Patent Washing Machine.

These washing machines are well calculated to preserve and prevent the wear of clothes, to save time, labor, and expense. They will extract stains and streaks from clothing, which cannot be taken out in any other way except by bleaching. The whole machine is so constructed that a child of 10 or 12 years of age may use it with the greatest facility, being a fluted cylinder rolling on an inclined board, with a pounder hung on a spring attached to it, as represented in the above plate.

The proprietor of the patent washing machine offers it with the fullest confidence to the trade and the public generally, as the best of modern inventions for washing—saving time, greatly lessening labor, and operating with singular facility. It is manufactured and sold by Francis S. Lane, 279 Bleecker street, New-York.

Scythe Sneaths.—Mr. Silas Lamson, of Cummington, has a great reputation for good scythe sneaths. He employs about fifteen hands, and makes nearly two hundred a day. He intends to manufacture fifty thousand a year, and the proceeds of his sale will not fall much short of $25,000 annually! This is but one specimen of Yankee thrift and industry.



Angevine's Patent Lever and Double Churn.

It appears to us that this is an improvement on the hitherto tedious operation of churning. From a close examination of this churn, when exhibited at the last Fair of the American Institute in this city, we are induced to give it our decided approbation. It is manufactured and for sale at 279 Bleecker street, New-York, where also those who wish to manufacture these articles may purchase, on moderate terms, patent rights for states, counties, or towns.

General Knowledge. — Whatever may be thought of the following remarks of Sir William Temple in other respects, their justice in relation to the medical profession must be universally acknowledged. "It is certain, however," says this distinguished writer, "that the study of physic is not achieved in any eminent degree, without very great advancements in the sciences; so that whatever the profession is, the professors have been generally very much esteemed on that account, as well as of their own art, as the most learned men of their ages, and thereby shared with the two other great professions in those advantages most commonly valued, and most eagerly pursued; whereof the divines seem to have had the most honor, the lawyers the most money, and the physicians the most learning."

Hippocrates was profoundly skilled in natural knowledge, before he commenced the study of medicine; and it has become a common saying, that where the natural philosopher ends, the physician begins. The laws which regulate other material substances apply to the human body. Chemistry is all essential to a physician. "I do not hesitate to pronounce," said Fourcroy, "that modern chemistry has done more, in twenty years, for medicine than all the united labors of preceding ages." The materia medica is supplied from the three kingdoms of nature. Without a knowledge of botany, mineralogy, and zoology, a physician cannot understand the medicines he prescribes, and as the nomenclature of his profession is derived from the learned languages, and principally from the Greek, he ought to be a classical scholar. In a word, he should have a general acquaintance with all the departments of human knowledge, in order to compose that learned man which is expected from an able and accomplished physician.—[Scientific Tracts.]

Affection.—Real and pure affection is always quiet and deliberate in its attention, and no man of refinement can long love a wife whose demonstrations of attachment are obtrusive and importunate.—[Mrs. Hale.]